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172/65

24 May 1965

Dear Bill:

In accordance with your recent request, we are forwarding two copies of our Phase II Work Statement for Proposal [] Multiple Image Integration, and copies of the related cost estimate.

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You will note that the Phase II Work Statement refers to two alternatives, cathode ray tube display, or optical viewing. We have mentioned optical viewing (or projection) as a second alternative because the possibility exists that our current EROS development program, with which you are familiar, will show that an optical approach might be recommended for implementation. Because of this possibility, we have also provided [] for completeness of your records with quotations on materials which might be required in case the optical approach is to be implemented.

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The Phase II cost estimate which is attached is based on the electronic approach as originally proposed in our technical document [] of 3 December 1964, and as modified according to the attached work statement. At this time we anticipate that we will recommend implementation of this approach.

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If we can furnish any additional information, please do not hesitate to call.

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Very truly yours,

[]

BCA:dm
Attachments

Declass Review by NGA.

24 May 1965

Work Statement

MULTIPLE IMAGE INTEGRATION

Proposal

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Phase II - Work Statement

The results obtained in Phase I, feasibility demonstration, will indicate the degree of success expected in the use of electronic correlation of multiple images. It should be noted that the use of electronic scanning and correlation does not in itself determine the method of image transformation and viewing to be used. There are two alternatives:

1. Cathode ray tube display
2. Optical viewing (or projection)

At the time Phase II will be embarked on, expects to have built and tested automatic registration viewers of both types, and to have some knowledge of their relative merits.

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The choice of the optimum viewing system for multiple image integration will therefore be made in consultation with the customer at the start of Phase II, and will determine the exact form of the equipment. Most of the work to be carried out on Phase I is equally applicable to either viewing system, as it is concerned with the behavior of the correlator when presented with material of different geometry, with material containing diurnal or

Phase II Work Statement

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seasonal variations, or with material of different information content. Similarly, the work to be carried out in Phase II will follow the same pattern whichever viewing or display system is chosen.

The basic parameters of the equipment to be built remain as described in the proposal. Provision will be made for three inputs consisting of film chips or glass plates up to $9\frac{1}{2} \times 9\frac{1}{2}$ inches. Any one or any combination of images may be independently viewed. Two modes of operation will be provided:

1. Manual registration
2. Automatic registration using zero-order and first-order transformations

Circuitry for shadow suppression and automatic weighting of the inputs according to their information content will be included.

Provision will be made both for viewing and printing out the integrated image.

First Period - Four Months

During this period, detailed design of the electronic, optical and mechanical elements of the prototype image integration viewer will be accomplished. Sections of the equipment not previously developed and tested in Phase I (or in related equipment) will be checked out in the laboratory. This will include the sequence and flicker control, the commutating unit and the memory unit. Procurement of materials and components will be initiated.

Phase II Work Statement

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Second Period - Four Months

Fabrication, assembly, and wiring of the system will be conducted during this period. Sub-assemblies will be individually tested and debugged as far as possible before incorporation into the main system. Most of the printed circuit boards and power supplies can be checked in this way. Initial system debugging and testing will be started.

Third Period - Four Months

Final system adjustments will be made, and system performance as regards registration with different types of input material will be optimized. The effectiveness of the shadow suppression circuitry and weighting networks will be determined.

A final report will be written describing the studies, experimental results and equipment used. Operating and maintenance instructions for the multiple image integration viewer will be compiled.

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11 May 1965

Dear Bill:

25X1 The purpose of this letter is to clarify and to update the various documents which [] submitted in connection with "The Combination and Optimization of Multiple Coverage and Multi Sensor Imagery".

25X1 Initially, a technical proposal [] of 3 December 1964, and a covering letter and cost breakdown of 2 December 1964 were submitted describing a two-phase program for an estimated price of []

25X1 Subsequent discussions with the technical personnel indicated an immediate interest in Phase I only. The estimated price for Phase I was [] as submitted on 2 December 1964. In accordance with this interest and in response to a specific request for further clarification, a letter was prepared on February 19, 1965 (Technical Proposal [] entitled "Feasibility Study of Electronic Image Superimposition". This letter of 19 February attempted to clarify the proposed efforts under Phase I as previously described in the original technical proposal of 3 December 1964. Furthermore, it was the purpose of this letter to restrict the initial efforts to integrating multiple coverage photography only and not attempting to combine and optimize multi-sensor imagery as well. This restriction was imposed at the request of the technical personnel with whom the proposed efforts had been discussed.

25X1 Since the submittal of the last document concerning the proposed program on 19 February 1965, various tests which have a bearing on the proposed efforts were conducted. A test report describing the various experiments conducted on the ARES Viewer was passed on as an information copy to the technical personnel concerned with the proposed image integration efforts. As a result of our studies and tests concerning the general applicability of ARES technology to the problem of image integration which were carried out since February 19, 1965, we have somewhat modified the scope of work previously suggested in the document [] of 19 February 1965. This modification does not change the basic objectives but reflects the experience gained during the last few months. The objective of the efforts during these four months will be to demonstrate the feasibility of integrating multiple coverage photography by electronic techniques using a modified ARES Viewer. An appropriate, brief and descriptive title for these efforts appears to be "Feasibility Demonstration - ARES Image Integration".

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The estimated price for the proposed efforts on a Cost-Plus-Fixed-Fee is [] including a fixed fee of []. A work statement and cost breakdown are attached. Furthermore, in order to facilitate your review of the entire matter, we are attaching the following documents:

1. Technical Proposal [] of 3 December 1964 entitled "The Combination and Optimization of Multiple Coverage and Multi-Sensor Imagery";
2. Covering letter and cost breakdown accompanying this technical proposal dated 2 December 1964;
3. Clarification letter [] entitled "Feasibility Study of Electronic Image Superimposition" of 19 February 1965;
4. Test Report on the ARES Viewer of 14 April 1965 (Project 5261.01).

Please note that the last document is an internal [] publication and is submitted for your information only.

Should you require any further information regarding the entire matter, please do not hesitate to contact either [] []

Very truly yours,

BCA:dm
Attachments

10 May 1965

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Work Statement

FEASIBILITY DEMONSTRATION -

ARES IMAGE INTEGRATION

The objective of the proposed four months' program will be to demonstrate the feasibility of combining and optimizing multiple coverage photography for the purpose of image integration by electronic techniques using a modified ARES Viewer.

The modifications of an ARES Viewer will include:

1. The addition of manually controlled second and third order transformations to correct for residual distortion of oblique and panoramic material.
2. The design and implementation of a variable gamma video amplifier to correct for differences in the gamma of the input material.
3. The design and implementation of circuitry for shadow suppression to improve correlation of photographic imagery taken at different times of day for different seasons of the year.

In addition to the above modifications of the ARES viewer, theoretical and experimental work will be performed concerning 1) methods of correcting relief displacements by the use of high order transformations; 2) methods of weighting the input material in accordance with its information content in order to avoid degradation of the integrated image.

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Work Statement - []

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The feasibility of integrating multiple coverage photography will be demonstrated with representative photographic material of different inherent geometry and exterior orientation. The integrated images will be added or subtracted electronically and displayed on a single cathode ray tube. Photographic records of the output imagery will be obtained indicating the degree of correlation achieved with various types of input material. During the last stages of the proposed feasibility demonstration it may be desirable to ship the modified ARES Viewer to [] Data Analysis Center

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[] Advisability of such transfer of equipment and further experimental work will be decided upon after consultation with the cognizant technical monitor.

Monthly letter progress reports will be submitted during the proposed study. The end product of the proposed efforts will be a final report comprising 1) a summary of all theoretical and experimental work conducted during the study, and 2) the definition of all pertinent design parameters for a multiple image integration viewer based on the results of the experimental verification to be conducted under the proposed program.

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